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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.      | CONFIRMATION NO. |
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| 08/926,592  | 09/04/1997  | SHUNPEI YAMAZAKI     | 0756-1717                | 7227             |
| 7590 09/09/2004   |             |                      |                          |                  |
| NIXON PEABODY LLP<br>8180 GREENSBORO DRIVE<br>SUITE 800<br>MCLEAN, VA 22102 |             |                      | EXAMINER<br>PERT, EVAN T |                  |
|   |             |                      | ART UNIT<br>2829         | PAPER NUMBER     |

DATE MAILED: 09/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

08/926,592

Applicant(s)

YAMAZAKI, SHUNPEI

Examiner

Evan Pert

Art Unit

2829

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 13,16,17 and 20-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 17 is/are allowed.
- 6) ☒ Claim(s) 13,16,20,21,23-26 and 28-30 is/are rejected.
- 7) ☒ Claim(s) 22 and 27 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☒ Certified copies of the priority documents have been received in Application No. 06/801,768.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>0704</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Objections***

1. Claim 20 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Claims 13, 16 and 17 already recite that "the cleaning gas comprises nitrogen fluoride," and claim 18 was canceled.

### ***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 13, 16, 20, 21, 23-26 and 28-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 0 115 645 A2 to Fuji Xerox Co., Ltd. (Fuji '645) in view of Takagi et al. (U.S. 4,539,068) taken with Sherman et al. (U.S. 4,563,367) and Romano-Moran (WO 80/01363).

#### **Teaching of Primary Reference**

Fuji's '645 document discloses a vapor reaction method for making electronic devices (i.e. photoelectric conversion devices) wherein a first layer comprising silicon oxide is formed on a substrate in a plasma CVD reaction chamber and a second layer comprising silicon nitride is successively formed on the first layer comprising silicon oxide in the plasma CVD reaction chamber.

Silence of Primary Reference

The '645 document is silent about the exact style of plasma reaction chamber or prior art particulars of the chamber use.

The '645 document is also silent about cleaning the chamber with a cleaning gas comprising nitrogen fluoride.

Secondary Reference Teaches details of a plasma reaction chamber

Takagi et al. ('068) teaches an improvement for a plasma reaction chamber wherein multiple sources excite electrodes in the chamber for better deposition.

Takagi et al. also depicts a "prior art" plasma CVD chamber in Fig. 1 along with their improvement in Fig. 3.

Each of Takagi's depictions of plasma CVD chambers in Figs. 1 and 3 meet claim limitations directed to electrode configuration and gas inlet configuration.

Secondary Reference Teaches cleaning a plasma reaction chamber

Both Takagi et al. and Fuji's '645 document are silent about "cleaning gas," yet Sherman explains that all deposition reaction chamber "in general" form deposits on internal surfaces including the walls and electrodes during deposition" [col. 3, lines 18-21].

Sherman further explains that "these surfaces must be cleaned after a number of deposition cycles," and that a typical prior method of cleaning was inefficient, requiring disassembly and wet etching the chamber parts, which was "awkward " [col. 3, lines 22-29]. In col. 3, Sherman explains "any" reactor system "has the potential for self-cleaning using the system plasma electrodes or coils to generate an etching plasma" [col. 3, lines 30-33].

Furthermore, the self-cleaning "potential" described by Sherman (using a cleaning gas without disassembly of the reaction chamber) was recognized in the art as desirable in plasma reaction chambers, because, as taught by Romano-Moran in 1980, "cleaning in situ reduces operating time and costs and increases safety of operation" [Basic-Abstract].

#### Statement of Obviousness

It would have been obvious to one of ordinary skill in the art at the time of the instant invention to practice the vapor reaction method taught by Fuji ('645) wherein a silicon oxide layer and silicon nitride layer are formed successively on a substrate in a plasma CVD reaction chamber, in a reaction chamber disclosed by Takagi et al. ('068), with a step of introducing and exciting a cleaning gas comprising nitrogen fluoride in the reaction chamber as taught by Sherman ('367).

Statements of Motivation

One of ordinary skill in the art would have been motivated to adopt the chamber of Takagi et al. [Fig. 3], or the prior art reaction chamber of Takagi et al. [Fig. 1], because these are "plasma CVD" reaction chambers required by Fuji ('645) and can deposit silicon oxide and silicon nitride at lower temperatures than conventional CVD, avoiding damage to the photoelectric conversion elements being made in the method of Fuji ('645).

One of ordinary skill in the art would have been motivated to adopt the step of "introducing and exciting a cleaning gas comprising nitrogen fluoride through the gas inlet electrode" in Takagi et al., because, as explained by Sherman ('367), "any" reactor system "has the potential for self-cleaning using the system plasma electrodes or coils to generate an etching plasma" [col. 3, lines 30-33] and "nitrogen fluoride" is a prior art recognized "etching cleaning gas" [col. 5, line 14].

Furthermore, the self-cleaning "potential" (using a cleaning gas without disassembly of the reaction chamber) is recognized as desirable in prior art reaction chambers, because, as taught by Romano-Moran, "cleaning in situ reduces operating time and costs and increases safety of operation" [Basic-Abstract].

Specific Claim Limitations

The scope of applicant's rejected linguistically lengthy claims are conceptually defined by a combination of three conceptual elements, brought together by the three references relied on for rejection, the three conceptual elements being:

1. Combinations of types films formed in succession in a reaction chamber.
2. Configuration of the reaction chamber with gas feed and electrodes.
3. Self-cleaning with cleaning gas introduced into the reaction chamber

All claim limitations of the rejected claims are collectively disclosed by the obvious combination of practicing the method of Fuji ('645) in a chamber of Takagi et al. ('068), including self-cleaning a plasma reaction chamber with  $\text{NF}_3$  disclosed by Sherman ('367):

The specifically claimed steps of "providing...", "placing...", "introducing...", "exciting...", "removing...", and "conducting...", as recited in the claims are *necessary* acts for practicing the method of Fuji ('645) in a chamber of Takagi ('068) with cleaning gas at the direction of Sherman ('367).

***Allowable Subject Matter***

4. Claim 17 is allowed.
5. Claims 22 and 27 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 17, the prior art does not disclose or seem to motivate a person to practice applicant's claimed "vapor reaction method" particularly characterized by the steps of "forming a first film comprising silicon nitride in a reaction chamber" and "forming a second film directly on the first film (i.e. directly on the film comprising silicon nitride) in the reaction chamber," wherein "a cleaning gas is introduced into the reaction chamber and is excited in order to remove unnecessary layers formed due to the formation of the first and second films," wherein the method necessarily requires a particular reaction chamber configuration, with no equivalence of other reaction chambers, no equivalence of cleaning gas, and no equivalence of first and second films being contemplated by the examiner in indicating allowability of claim 17.

Regarding claims 22 and 27, the prior art does not disclose applicant's method using a reaction chamber with electrodes and cleaning gas, particularly characterized by the first chemical vapor deposition being limited to a "photo CVD."

### ***Response to Arguments***

7. Applicant's primary argument in response to the last Office Action pointed out that the reference relied on for teaching a "reaction chamber" configuration is absolutely silent about cleaning, so the reaction chamber reference shouldn't be combined with a reference disclosing cleaning of a reaction chamber.



Applicant's argument is unconvincing since Sherman is relied on for explaining the problem of cleaning as applicable to any reaction chamber and that any plasma reaction chamber has "the potential for self-cleaning using the plasma electrodes to generate an etching plasma."

8. Applicant's arguments with respect to claims 13, 16, 21, 23-26 and 28-30 have been considered, but are moot in view of the new grounds of rejection.

***Conclusion***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan Pert whose telephone number is 571-272-1969. The examiner can normally be reached on M-F (7:30AM-3:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Tokar can be reached on 571-272-1812. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ETP  
September 7, 2004

  
**EVAN PERT**  
**PRIMARY EXAMINER**